NPIC/TSSG/DED-159-69
26 March 1969

MEMORANDUM FOR: Chief, Technical Services & Support Group, NPIC
THROUGH : Chief, Planning, Programming & Budgeting Staff, NPIC
SUBJECT : Possible R&D Requirements for ORD

We have reviewed our present and future program requirements, and it would appear that the following general items could be levied as NPIC tasks for research & development by ORD/DDS&T:

(1) General Computer Support in the Area of Digital Image Restoration and Digital Image Manipulation -- This support may require the development of specialized input and output equipment required to adequately digitize high resolution continuous tone imagery. NPIC generally has a requirement for improved methods of digitizing images for subsequent computer analysis and for high quality print-out equipment to once again visually record the image data after mathematical manipulation.

(2) Low Cost Lens Production -- High quality lenses are expensive. It should be valuable to study means of producing high quality lenses at lower cost. Techniques are available to produce accurate, intricate shapes on hard materials such as ceramics and rubies using high frequency sound waves for energy and abrasives for cutting. Perhaps these or other techniques can be used to shape glass lenses. This technology could lower the cost of NPIC's exploitation equipment development.

(3) Modulation Transfer Function -- NPIC needs better systems of testing and evaluating lenses. While there is great opposition to MTF from some quarters, we also know that Resolution Bar Target tests are not a true measure of a lenses quality.

This requirement should be oriented toward lenses used in acquisition and exploitation of aerial imagery and not toward the microfilm--printed matter criteria--used by Bureau of Standards. We need to work from simple lenses with the ultimate goal of developing methods for testing large complicated systems.

(4) Single Emulsion Color Photographic Film -- At present, color film is composed of several layers of emulsion and filters. The resultant imagery is produced on several different planes and

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resolution is not as good as that produced with a single black and white emulsion layer. There is a need for a film capable of recording color imagery but with resolutions comparable to high quality black and white films.

(5) Optical Filtering -- The application of optical filtering to ATR problems has progressed about as far as the current state-of-the-art will permit. Investigations that may lead to basic breakthroughs or to the discovery of some totally new approach are sufficiently important to warrant investigation. The development, for example, of a real time filter generating capability would be a big step towards implementing the automation of many Automatic Target Recognition functions.

(6) Normal cold cathode tubes used in contemporary light tables and light boxes have many undesirable characteristics. Foremost among these are lack of uniformity of illumination across the format and a tendency to flicker at low intensity levels. Research into unusual light sources, such as luminescent panels, etc., could result in a breakthrough in the development of advanced light tables for the viewing of high resolution film. A minimum intensity of 2000 foot lamberts at maximum output is required, with higher intensities highly desirable.

(7) Measurement of Visual Fatigue -- There is a need for a method of measuring visual fatigue in order that an assessment can be made of its effects on photo interpreter performance as a function of time. The method needs to be one by which fatigue can be measured--on a non-interference basis--while an interpreter is performing operational P.I. tasks in his normal environment, using normal P.I. viewing equipment (particularly microstereoscopes) while operating on operational imagery. The results of this research, if successful, could culminate in the design of less-fatiguing optical equipment, in improved interpreter procedures, and perhaps in remedial visual training.

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